ELECTRICAL MAINTENANCE PROGRAM WITHIN THE MANUFACTURING ENGINEERING LABORATORY

A PRESENTATION BY

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The requirements of the electrical maintenance program with the Manufacturing Engineering Laboratory have gradually increased. When the program first began, sufficient time and personnel were available to accomplish any necessary repairs. During that time the M.E. Lab. carried an inventory of the "hard-to-get" parts for all machines serviced plus a reasonable stock of tubes, resistors, capacitors, relays, and other usual electronic and electrical components. As the welding control equipment and the machine tools serviced by the M.E. Lab. became more complex, a large inventory of parts with a closer scrutiny of the number of these parts became necessary. Now, in addition to the above mentioned parts, whole chasses or assemblies are kept in stock. Some examples are: the Sciaky travel drawer, Sciaky Arc Head Chassis and the Photo reader for the DiMil.

As Table 1 indicates, additional steps were initiated in order to make the maintenance program more effective, expecially the principle welding systems.

The welders that are used directly for vehicle fabrication have been subject to various types of troubles. A great portion of these welders are of Sciaky manufacture. They have been known to develop "sticky" cases of trouble after numerous test pieces had been satisfactorily welded.

In order to circumvent such trouble, we engaged a Sciaky design engineer to study these machines under operation and supply remedial measures.

On the basis of his studies, temporary modifications were made and tried under welding conditions. The tests proved satisfactory, and these modifications were permanently installed in the welders. In addition, the Sciaky Company is

revising its drawings to show these changes, and copies are being furnished to us.

Essentially the changes consisted of the addition of a cathode follower circuit in the arc head chassis and the addition of two capacitors and minor wiring changes in the current source drawer. The former provides instant response to any change made in the arc voltage pot setting. Before this, a change in the pot setting would not be realized until its time setting had run out. The change in the current source drawer provided an instant response for any change in the current pot setting.

The second step toward a more effective maintenance program, as shown in Table 2, involved the installation of log books in the control cabinet of each principle welding system and in each of the more complex machine tools. The technicians, who restore the machine to satisfactory operation, record in the log books the causes of trouble, date of occurrence, symptoms, solution, and the components replaced.

Hour meters are being installed, which will indicate the elapsed time of operation of each machine. The log book entries will also reflect the readings of the hour meters. This system will then show the frequency of trouble cases in relation to the hours under which the machine was in operation.

A periodic summary of the entries made in the log books should provide valuable information concerning the life span of certain components and, perhaps, other relevant facts. Failure of some components may not be so easily categorized, and the reason for failure may not be detected until other facts are summarized at a later date.

Table 3 indicates those pieces of test equipment that have been purchased to improve trouble shooting both in convenience and time. The test cabinet is

a duplicate of the equipment employed in the Sciaky plant for similar testing. The timer-card-tester is used for testing the time settings on two-minute timer cards. The control timers are similar to those in use in the test facilities of the Sciaky Company. These timers are adjustable to any period up to two minutes with a single potentiometer adjustment. The digital voltmeter will have multiple uses in addition to calibrating the "Electronic 17" recorder.

The last step in the effective maintenance program consists of a count-down or checkout procedure which is made before each important weld is to occur. This procedure is shown in Tables 4 and 5.

The following slides will show some of the equipment presently in use at MSFC.

Figure 1 - View of Two Sciaky Welders.

Figure 2 - Sciaky Welder Including Control Panel.

Figure 3 - Sciaky Welder with Self-Contained Boom.

Figure 4 - "Y" Ring Being Lowered for Welding.

Figure 5 - Bulkhead with Gore Segments Welded.

Figure 6 - Use of Sciaky Welder on Base and Top Sections.

Figure 7 - Gore to Apex Welder Fixture.

MISCELLANEOUS ITEMS

1. Install NE 51 bulbs across the main power diodes (rectifier) of the welders.

   a. If one half of one light burns, the diode on that phase is functioning properly.

   b. If both halves of a light burn, the diode on that phase is open circuited and is not conducting in either direction.

   c. If no light appears in the bulb, the diode is shorted out, and it is conducting in both directions.

2. Care must be taken that the main cable to the torch does not pass near the arc. If this occurs, the arc will be deflected by the magnetic field which surrounds the cable. The result is that the weld bead flattens somewhat, and proper penetration is not achieved.

3. Care must be exercised in the location of the arc voltage pickup leads so that they do not carry part of the welding current. The brush or clamp where these leads are attached to the piece being welded should be made to one side of the connections of the ground cables to the piece.

STEPS TOWARD EFFECTIVE MAINTENANCE

1. MODIFY SCIAKY WELDERS.

2. CONTROL CABINET LOG BOOKS

3. PURCHASE OF TEST EQUIPMENT

4. COUNTDOWN AND CHECKOUT PROCEDURE

Table 1. Steps Toward Effective Maintenance

CONTROL CABINET LOG BOOKS

1. CASES OF TROUBLE
2. DATE OF OCCURRENCE
3. SYMPTOMS
4. SOLUTION
5. COMPONENTS REPLACED
6. HOUR METER READINGS

TEST EQUIPMENT

1. POWER SUPPLY CHASSIS, AMPLIFIER CHASSIS, ARMATURE CHASSIS, AND SCIAKY FUSION WELDER CABINET PLUG-IN INCLUDES AN OSCILLO-SCOPE FOR CHECKING DC RIPPLE ie, WHETHER ONE OR MORE OF THE RECTIFIERS IS DEFECTIVE FOR CHECKING POWER SUPPLY CHASSIS, AMPLIFIER CHASSIS, AND ARMATURE CHASSIS.
2. TIMER CARD TESTER FOR CHECK-ING TIMER AND CALIBRATING THEIR TIME SETTINGS.
3. SILICON CONTROLLED RECTIFIER TESTER.
4. DIGITAL VOLTMETER TO CALIBRATE "ELECTRONIC 17" RECORDER.

CHECKLIST FOR STARTING WELDING EQUIPMENT

1. CALIBRATE "ELECTRONIC 17" RECORDING VOLTMETER AND AMMETER; REINSTALL IN MACHINE AND CHECK CONNECTIONS.
2. CLEAN ALL AIR FILTERS AND VACUUM INSIDE OF WELDER CABINETS.
3. CHECK WELDING TERMINALS AND TERMINAL STRIPS TO INSURE SNUG FIT.
4. CHECK VOLTAGE FEEDBACK TO ARC-HEAD CONTROL.
5. CHECK THE CURRENT FROM THE WELDING POWER SUPPLY.
6. CHECK THE SERVO-SELSYN IN THE TRAVEL DRAWER.
7. CHECK FOR PROPER WATER AND GAS FLOW.

Table 4. Checklist for Starting Welding Equipment

CHECKLIST FOR STARTING WELDING EQUIPMENT (CONT.)

8. CHECK THE POWER RECTIFIERS UNDER LOAD.
9. CALIBRATE THE REFERENCE VOLTAGE POTS.
10. CHECK THE GROUNDING AND WELD-VOLTAGE PICKUP BRUSHES FOR CONTACT SURFACE, SPRING TENSION, AND PROPER CONNECTIONS.
11. INSTALL CHART PAPER IN RECORDERS AND SEE THAT PENS ARE INKING PROPERLY.
12. SET RECORDER INDICATORS TO ZERO.
13. ENERGIZE RECORDERS.

Table 5. Checklist for Starting Welding Equipment (cont.)

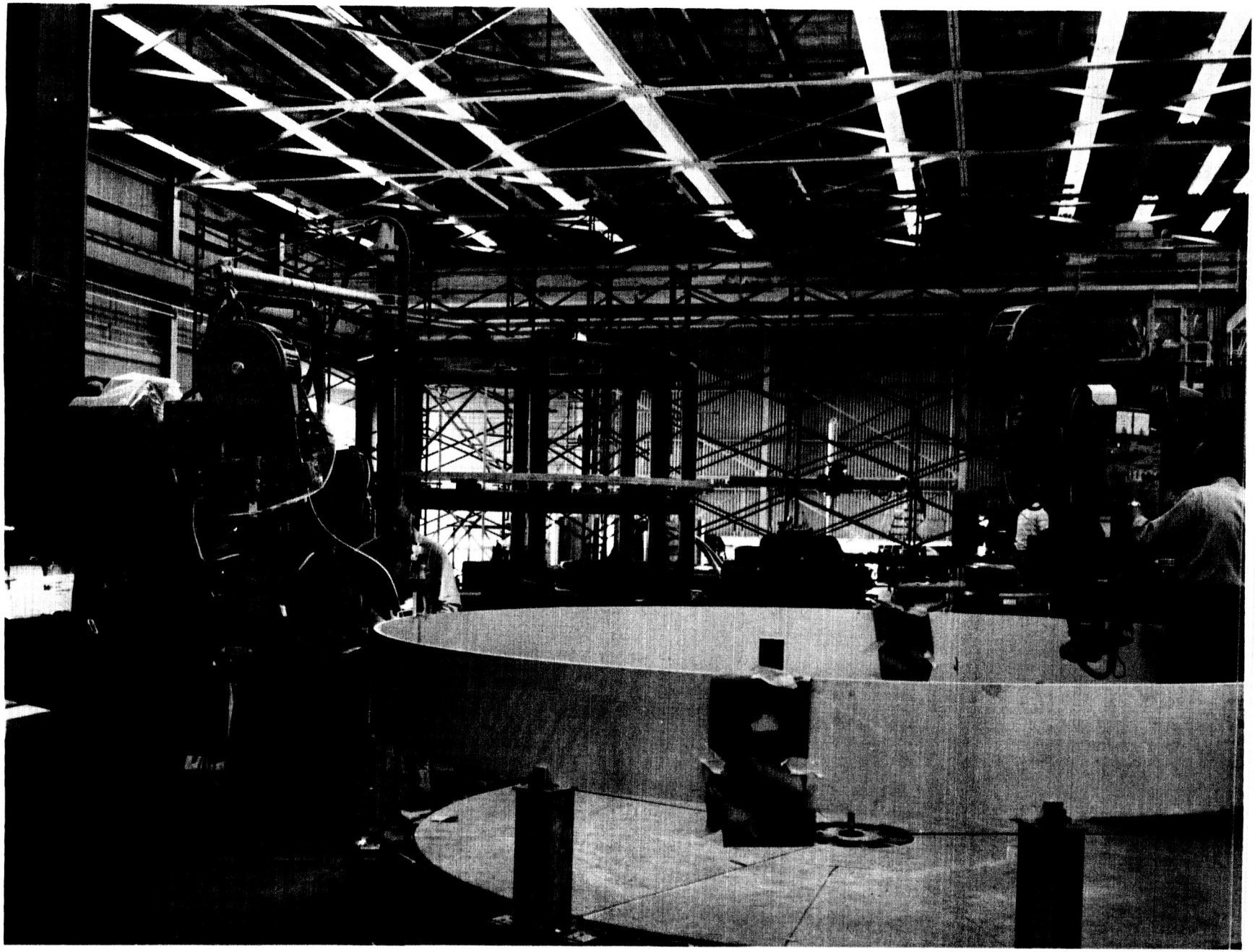

Figure 1. View of Two Sciaky Welders

Figure 2. Sciaky Welder Including Control Panel

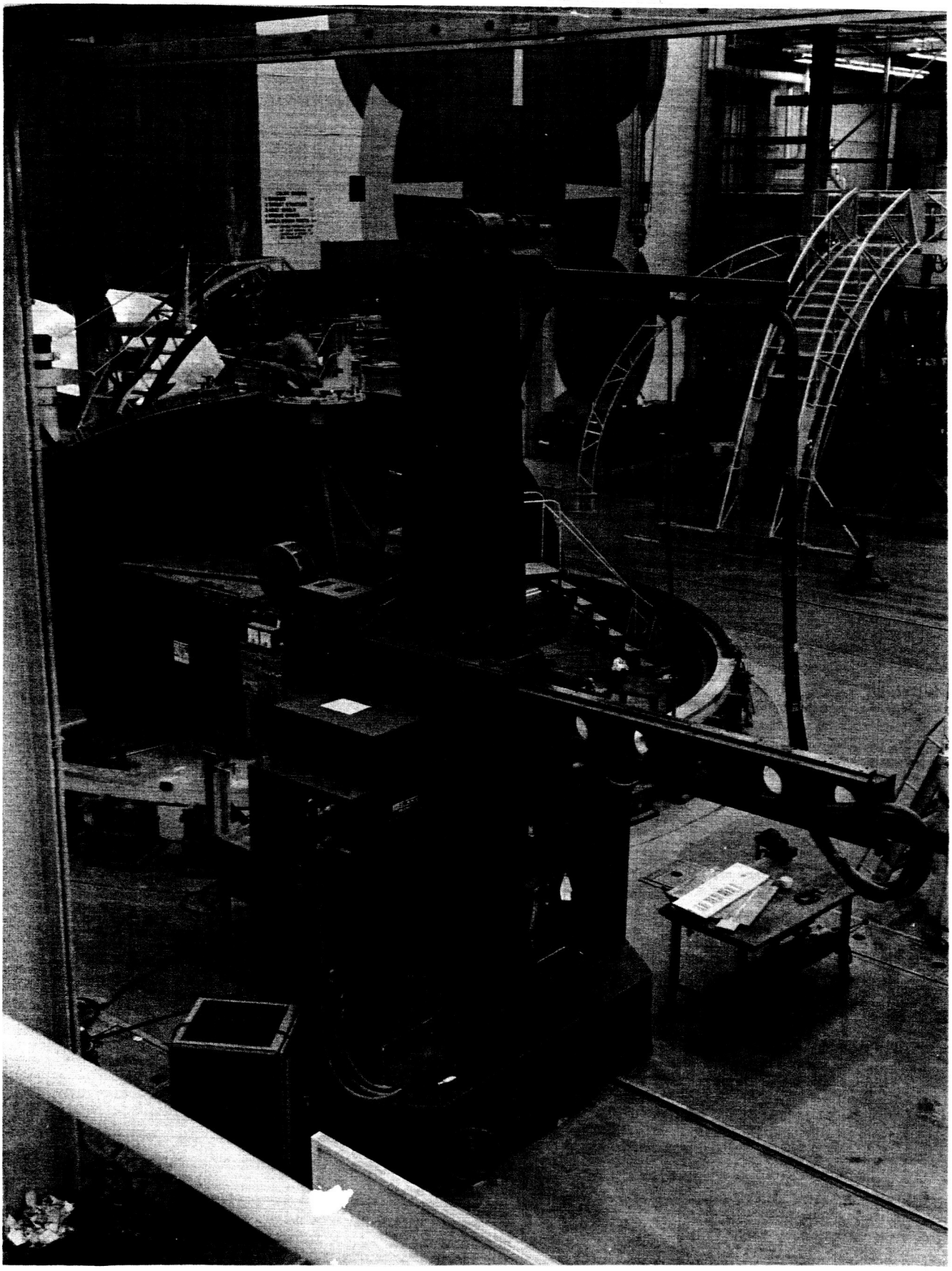

Figure 3. Sciaky Welder with Self-Contained Boom

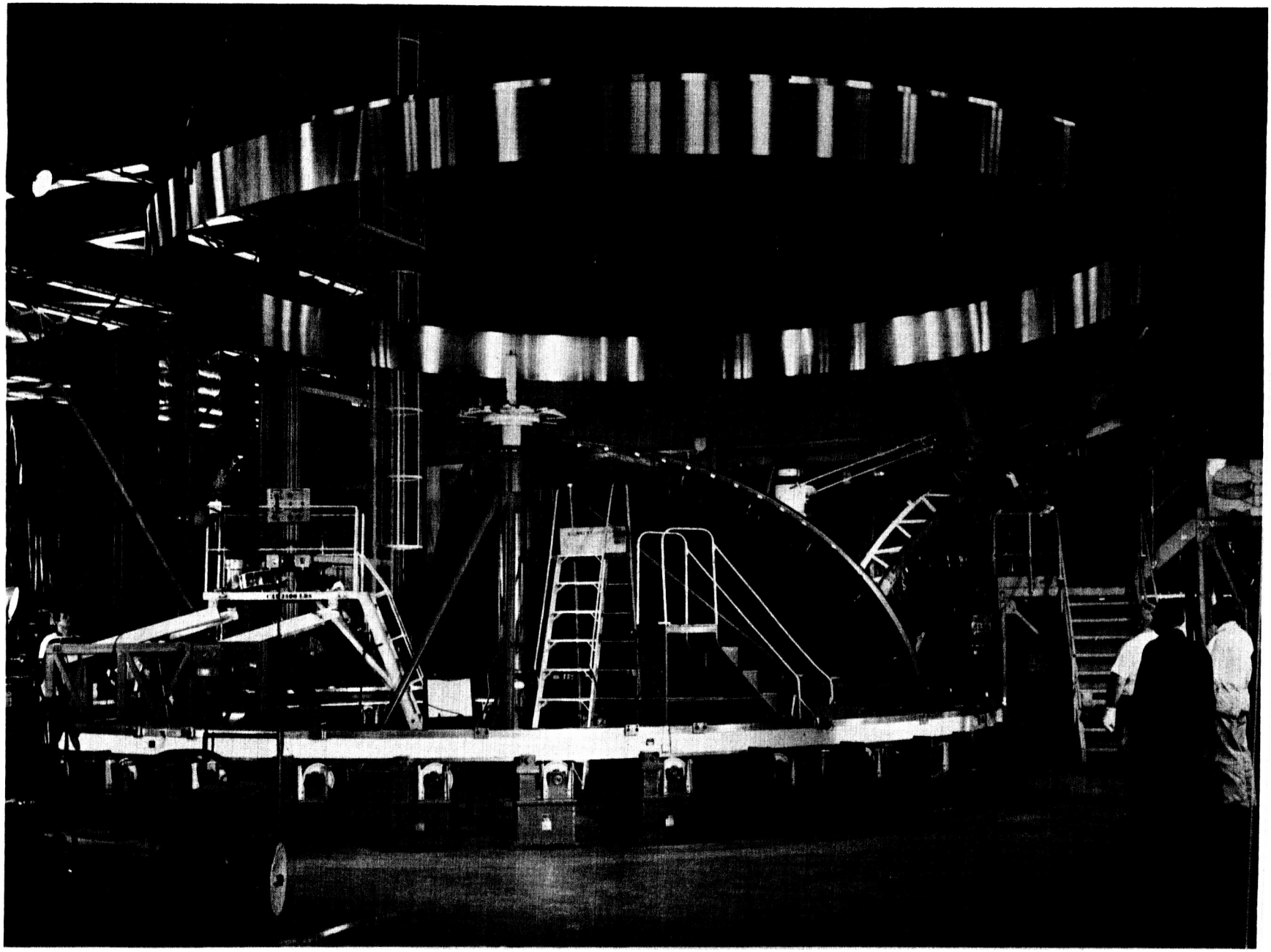

Figure 4. "Y" Ring Being Lowered for Welding

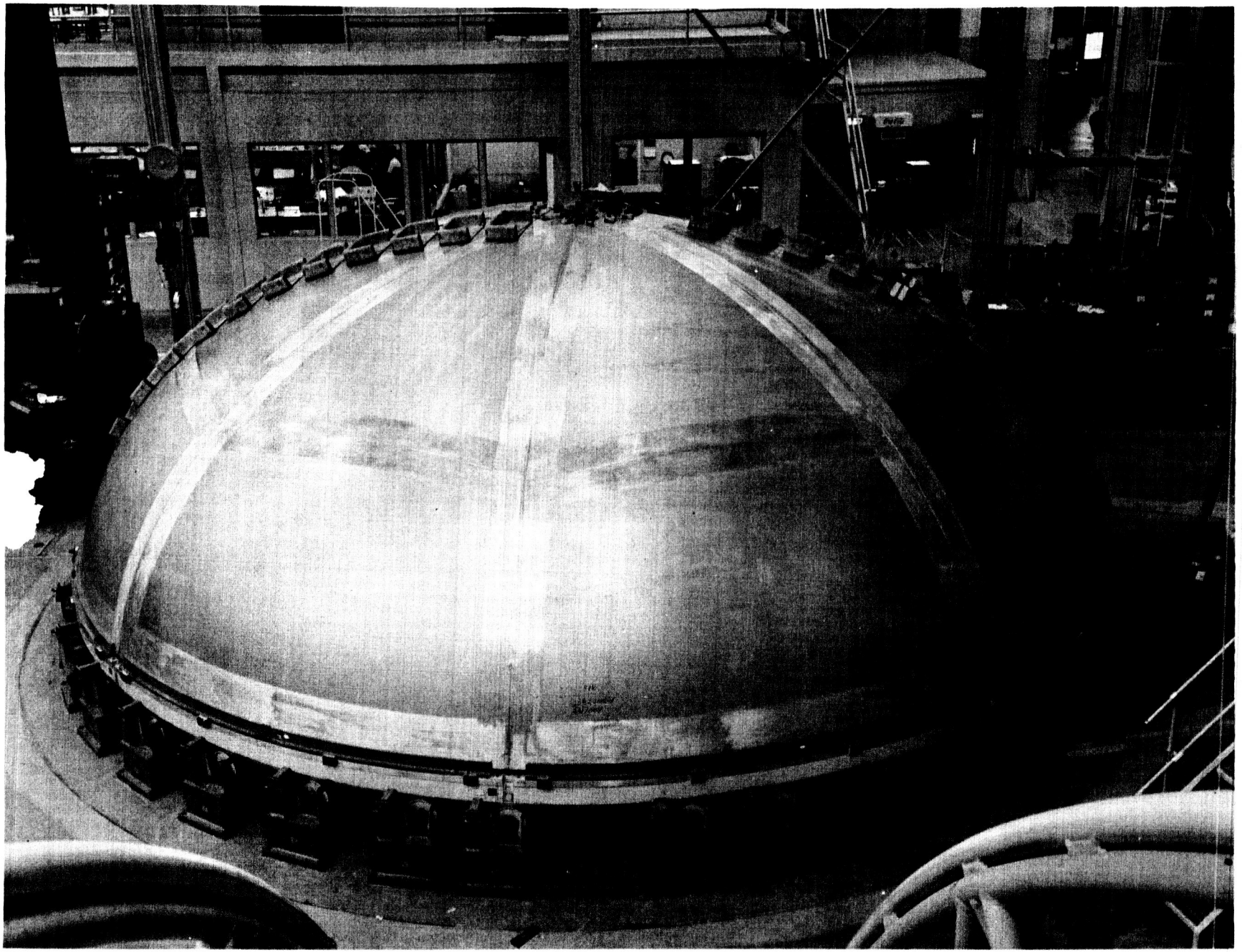

Figure 5. Bulkhead with Gore Segments Welded

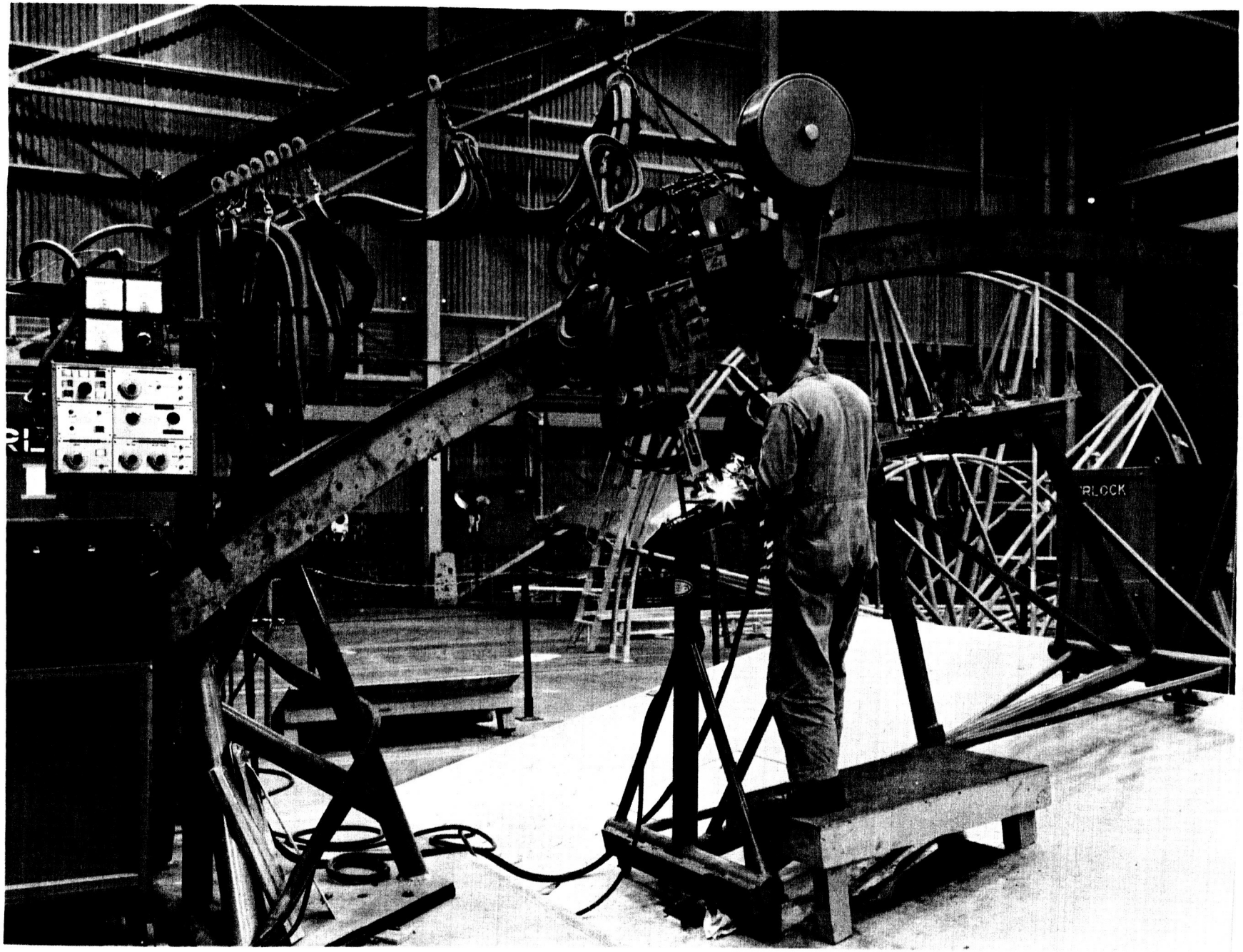

Figure 6. Use of Sciaky Welder on Base and Top Sections

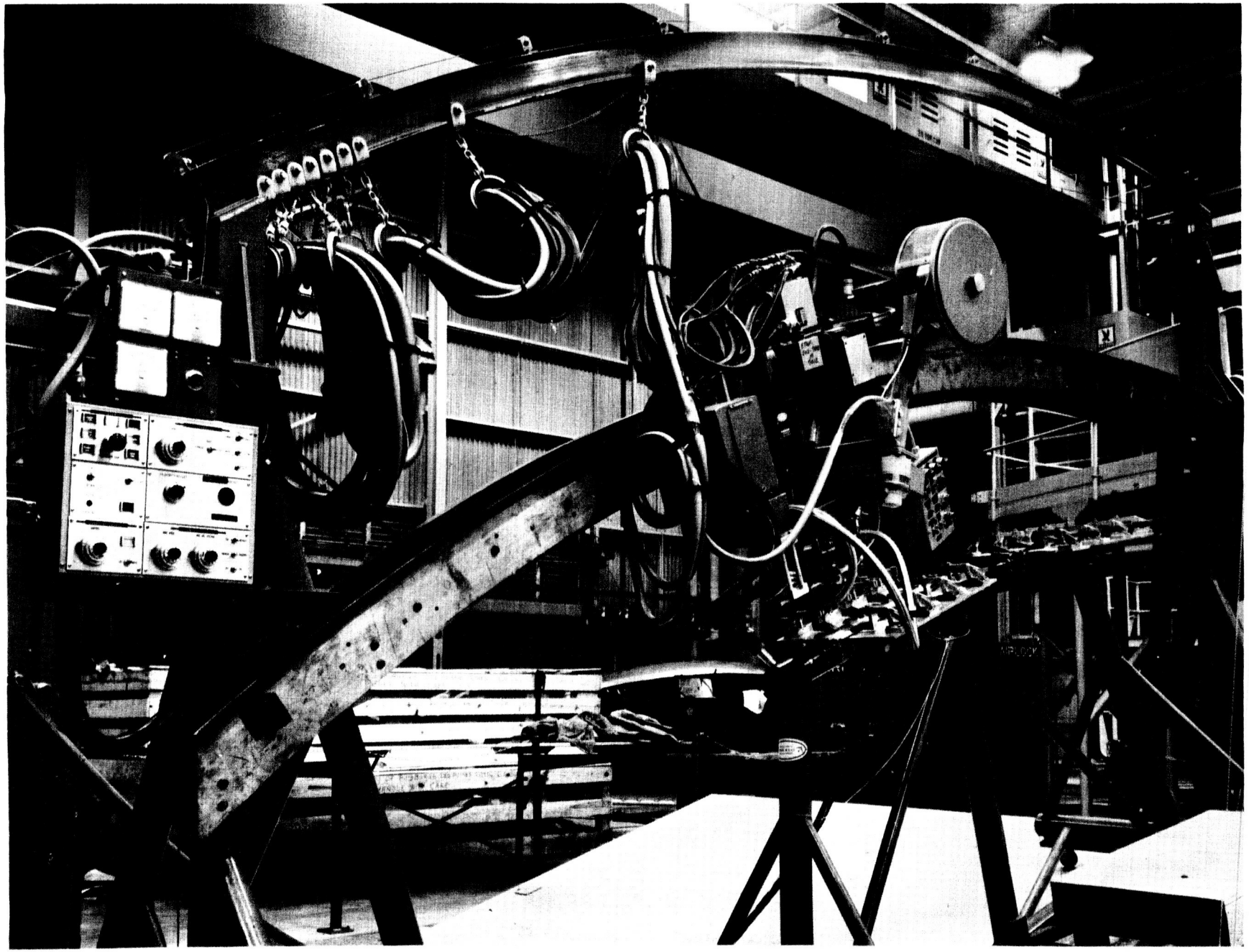

Figure 7. Gore to Apex Weld Fixture